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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,205	03/22/2004	Eiji Ogawa	Q80556	1127
23373 7590 05/18/2007 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER ABRAHAM, SALIEU M	
			ART UNIT 3709	PAPER NUMBER
			MAIL DATE 05/18/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

ED

Office Action Summary	Application No. 10/805,205	Applicant(s) OGAWA, EIJI	
	Examiner Salieu M. Abraham	Art Unit 3709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 1-18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>03/22/04</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the sixth paragraph of 35 U.S.C. 112:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

(Amended July 24, 1965, Public Law 89-83, sec. 9, 79 Stat. 261; Nov. 14, 1975, Public Law 94-131, sec. 7, 89 Stat. 691.)

a. A claim limitation will invoke 35 U.S.C. 112, sixth paragraph if it passes the following three-pronged test:

- i. The claim limitations **must use** the phrase “means for” or “step for”,
- ii. The phrase “means for” or “step for” **must be modified** by functional language, and
- iii. The phrase “means for” or “step for” **must not be modified** by sufficient structure, material or acts for achieving the specified function.

2. Claim 1 invokes 35 U.S.C. 112, sixth paragraph, as it meets all the requirements of the three-pronged test above. Therefore, the following claim limitations are being treated as invoking 35 U.S.C. 112, sixth paragraph in this action for art rejection purposes:

In Reference to Claim 1

a. drive signal generating means for generating drive signals for respectively driving said plural ultrasonic transducers;

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b. transmission control means for controlling said drive signal generating means such that ultrasonic waves to be transmitted from said plural ultrasonic transducers form a transmission beam to be transmitted in at least one direction;

c. reception control means for performing reception focusing processing on plural detection signals obtained based on ultrasonic waves received by said plural ultrasonic transducers so as to form a reception focal point in at least one direction thereby forming a reception beam; and

d. control means for changing directivity of plural ultrasonic components constituting the transmission beam in accordance with a sound ray direction in which the transmission beam is transmitted and/or changing directivity of plural ultrasonic components constituting the reception beam in accordance with a sound ray direction in which the reception focal point of the receiving beam is formed.

Have been interpreted as covering the following equivalents as described and when viewed in light of the specification:

a. the specified means could refer to the following drive signal generating equivalents: a pulser(s), waveform or ultrasonic pulse generator, (ultrasonic) transmitter/transmit unit, transmit beam former, an external (multifunctional ultrasound)) imaging instrument with drive pulse circuitry (page 1, line 25, page, lines 2-7 and page 16, lines 16-20),

b. the specified means could refer to the following transmission control means equivalents: transmit beam former or transmit beam steering circuit (page 15 lines 22-27 and page 16, lines 1-15),

c. the specified means could refer to the following reception control means equivalents: receive beam former or receive beam steering circuit, (page 17 lines 21-27 and page 18, lines 1-18),

d. the specified means could refer to the following control means for changing directivity of plural ultrasonic components equivalents: a master controller, system control/timing unit, (central) control system/unit/electronics (i.e. microprocessors, digital signal processors or DSPs, and optional computer code) which manages/adjusts system components and parameters which determine beam phasing (focusing upon transmit or/and receive and steering <applicant's directivity and sound ray direction>) characteristics (see applicant's scanning unit, page 15 lines 15-21).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

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form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat No. 6,066,099 to Thomenius (Thomenius).

In Reference to Claim 1

Thomenius teaches:

I. An ultrasonic transmitting and receiving apparatus comprising: an ultrasonic transducer array including plural ultrasonic transducers for transmitting ultrasonic waves and receiving ultrasonic waves reflected from an object to be inspected

(see fig.1, reference marks **10** and **12** and column 3, lines 36-45); other

teachings include, a

a. drive signal generating means for generating drive signals for respectively driving said plural ultrasonic transducers (see fig.1, reference mark **14** and column 3, lines 39-41);

b. transmission control means for controlling said drive signal generating means such that ultrasonic waves to be transmitted from said plural ultrasonic

transducers form a transmission beam to be transmitted in at least one direction

(see fig.1, reference mark **26** and column 3, lines 62-64);

c. reception control means for performing reception focusing processing on plural detection signals obtained based on ultrasonic waves received by said plural

ultrasonic transducers so as to form a reception focal point in at least one

direction thereby forming a reception beam; and (see fig.1, reference mark 30 and column 4, lines 62-67 and column 5, lines 1-8);

d. control means for changing directivity of plural ultrasonic components constituting the transmission beam in accordance with a sound ray direction in which the transmission beam is transmitted and/or changing directivity of plural ultrasonic components constituting the reception beam in accordance with a sound ray direction in which the reception focal point of the receiving beam is formed (see fig.1, reference mark 20 and column 3, lines 49-66, column 4, lines 50-65 and column 5, lines 1-15);

In Reference to Claim 2

Claim 2 states: "An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said control means makes the directivity of said ultrasonic components stronger as an angle formed by a front direction of said ultrasonic transducer array and said sound ray direction becomes smaller."

Thomenius has been shown to teach all the claim limitations with respect to claim 1. Thomenius further teaches the step "wherein said control means makes the directivity of said ultrasonic components stronger as an angle formed by a front direction of said ultrasonic transducer array and said sound ray direction becomes smaller" (see fig. 3 column 1, lines 43-46, column 3, lines 1-14, lines 60-67, column 4 lines 1-36 and 50-64, column 5, lines 29-41 and 46, and column

6, lines 28-44). The cited material in brackets all teach measures taken to orient or direct a resulting ultrasound beam according to the transmitting and receiving apparatus of claim 1 along with side lobe suppression (column 5, lines 29-41 and 46, and column 6, lines 28-44). These requirements are given by the applicant in the disclosure as being necessary for strengthening the directivity of the resulting individual waves from each ultrasound array element (**ultrasonic components**) along with a corresponding reduction in "an angle formed by a front direction of said ultrasonic transducer array and said sound ray direction" (see figs. 1A and 1B and page 9, lines 22-27 in specification).

In Reference to Claim 3

Claim 3 states: "An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said control means changes the directivity of said ultrasonic components by changing a number of ultrasonic transducers to be used simultaneously when forming said ultrasonic components."

Thomenius has been shown to teach all the claim limitations with respect to claim 1.

It is well known in the art that in order to manage ultrasound beam direction of propagation that the individual waves (**ultrasonic components**) constituting the beam (and their orientations or directivity) must be appropriately generated.

Because the waves emanate from the individual transducer array elements (**number of ultrasonic transducers**), it stands to reason that any change at the

array element will affect the resulting individual wave and its directivity as well.

Phase array ultrasound (used by Thomenius) applies time-based signals at the individual array elements in order to determine beam direction and focus. The elements may all be energized (e.g. have signals applied to them) during a given scan (**array firing**) or have single or multiple elements energized at different times. Therefore, Thomenius further teaches the step “wherein said control means changes the directivity of said ultrasonic components (see fig. 1, abstract, column 1, lines 33-46, column 2, lines 59-67, and column 3, lines 1-13) by changing a number of ultrasonic transducers to be used simultaneously when forming said ultrasonic components” (see, column 4, lines 14-21).

In Reference to Claim 4

Claim 4 states: “An ultrasonic transmitting and receiving apparatus according to claim 2, wherein said control means changes the directivity of said ultrasonic components by changing a number of ultrasonic transducers to be used simultaneously when forming said ultrasonic components.”

Thomenius has been shown to teach all the claim limitations with respect to claim 2 and the step “wherein said control means changes the directivity of said ultrasonic components by changing a number of ultrasonic transducers to be used simultaneously when forming said ultrasonic components” as described above (see claim 3).

In Reference to Claim 5

Claim 5 states: "An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components."

Thomenius has been shown to teach all the claim limitations with respect to claim 1. Thomenius further teaches the step "wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components" (see fig. 1, abstract, column 2, lines 59-67, and column 3, lines 1-13, and column 4, lines 14-21).

In Reference to Claim 6

Claim 6 states: "An ultrasonic transmitting and receiving apparatus according to claim 2, wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components."

Thomenius has been shown to teach all the claim limitations with respect to claim 2 and the step "wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components" as described above (see claim 5).

In Reference to Claim 7

Claim 7 states: "An ultrasonic transmitting and receiving apparatus according to claim 3, wherein said control means performs weighting on the plural drive

signals to be used when forming said ultrasonic components.”

Thomenius has been shown to teach all the claim limitations with respect to claim 3 and the step “wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components” as previously described (see claim 5).

In Reference to Claim 8

Claim 8 states: “An ultrasonic transmitting and receiving apparatus according to claim 4, wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components.”

Thomenius has been shown to teach all the claim limitations with respect to claim 4 and the step “wherein said control means performs weighting on the plural drive signals to be used when forming said ultrasonic components” as previously described (see claim 5).

In Reference to Claim 9

Claim 9 states: “An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said reception control means performs reception focusing processing on said at least one direction in which the transmission beam is transmitted so as to form reception focal points in plural directions.”

Thomenius has been shown to teach all the claim limitations with respect to claim 1. Thomenius further teaches the step “wherein said reception control

means performs reception focusing processing on said at least one direction in which the transmission beam is transmitted" (see claim 9/column 12, lines 26-27, 36-40, and 46-52) so as to form reception focal points in plural directions (see claim 1/column 10, lines 60-65, claim1/column 11, lines 23-29).

In Reference to Claims 10-13

Thomenius has been shown to teach all the claim limitations with respect to claims 2-5 respectively, and, additionally, Thomenius has been shown to teach the step "wherein said reception control means performs reception focusing processing on said at least one direction in which the transmission beam is transmitted" as described above (see claim 9).

In Reference to Claim 14

Claim 14 states: "An ultrasonic transmitting and receiving apparatus according to claim 1, wherein said reception control means performs reception focusing processing on plural directions in which the transmission beams are transmitted so as to form reception focal points in the plural directions, respectively."

Thomenius has been shown to teach all the claim limitations with respect to claim 1 and the step "wherein said control means performs reception focusing processing on plural directions in which the transmission beams are transmitted so as to form reception focal points in the plural directions, respectively" (see abstract, column 2, lines 59-67, column 3, lines 60-62, and column 4, lines 30-49

and claims 1 and 5).

In Reference to Claims 15-18

Thomenius has been shown to teach all the claim limitations with respect to claims 2-5 respectively, and, additionally, Thomenius has been shown to teach the step “wherein reception control means performs reception focusing processing on plural directions in which the transmission beams are transmitted so as to form reception focal points in the plural directions, respectively” as previously described (see claim 14).

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ogawa et al., Steinberg et al., Lu et al., McLaughlin et al., O'Donnell et al., Azuma et al., Uchiumi et al., and Ustuner et al., have been included because they respectively encompass ultrasound imaging systems and methods which find utility in side lobe reduction and/or which employ multidimensional (2D, 3D), high speed/high resolution apparatus and techniques similar to those described by the applicant for the proposed invention.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Salieu M. Abraham whose telephone number is (571) 270-1990. The examiner can normally be reached on Monday through Thursday 8:30 am - 6:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Bomberg can be reached on (571) 272-4922. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

5/9/07

SA



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PRIMARY PATENT EXAMINER